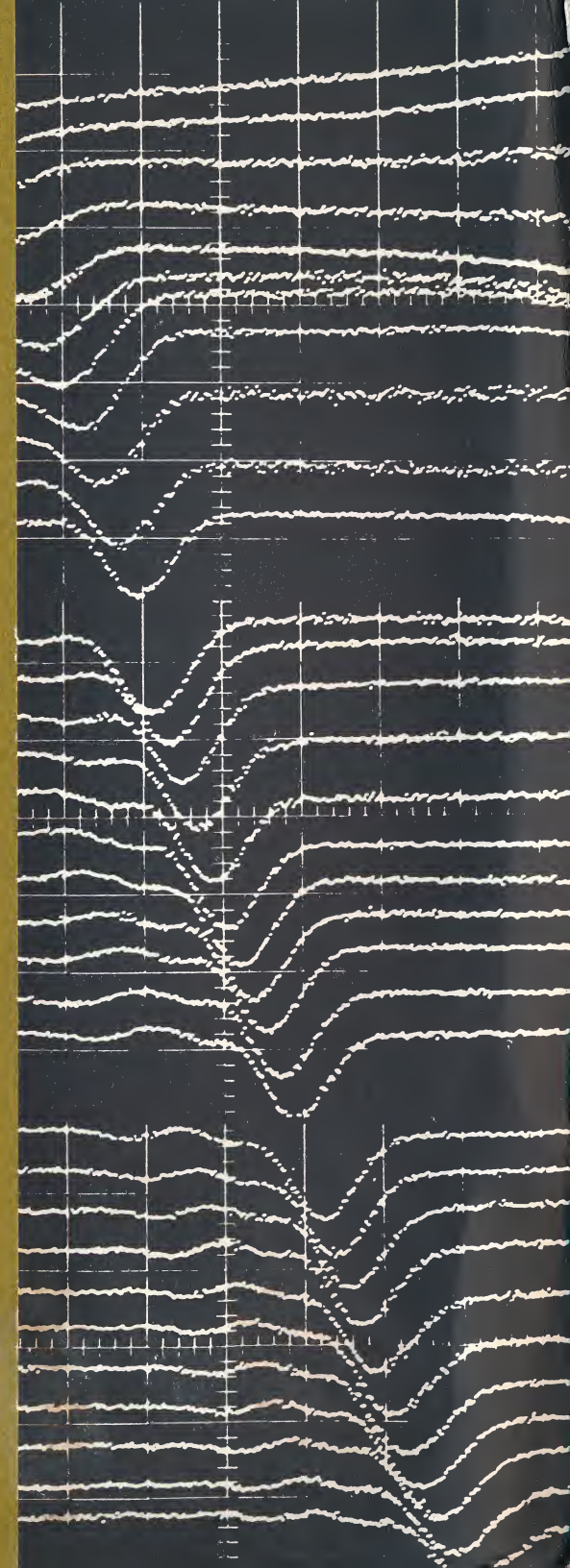


IBM

The Gunn Effect



**A magnified specimen
of gallium arsenide (dark band)
alloyed between
two metal contacts.
Actual thickness
of the specimen is
only 30 microns.**



Thirty-three successive oscilloscope traces follow the changes in the electric field associated with a current fluctuation passing through a block of gallium arsenide only 200 microns long. Under a constant voltage, the wave passes through the crystal and is immediately followed by another every few nanoseconds.

The Gunn Effect

The Gunn Effect is an electronic phenomenon first reported by J. B. Gunn of the International Business Machines Corporation. It has since been applied by Mr. Gunn and other IBM scientists to develop an experimental solid-state microwave generator.

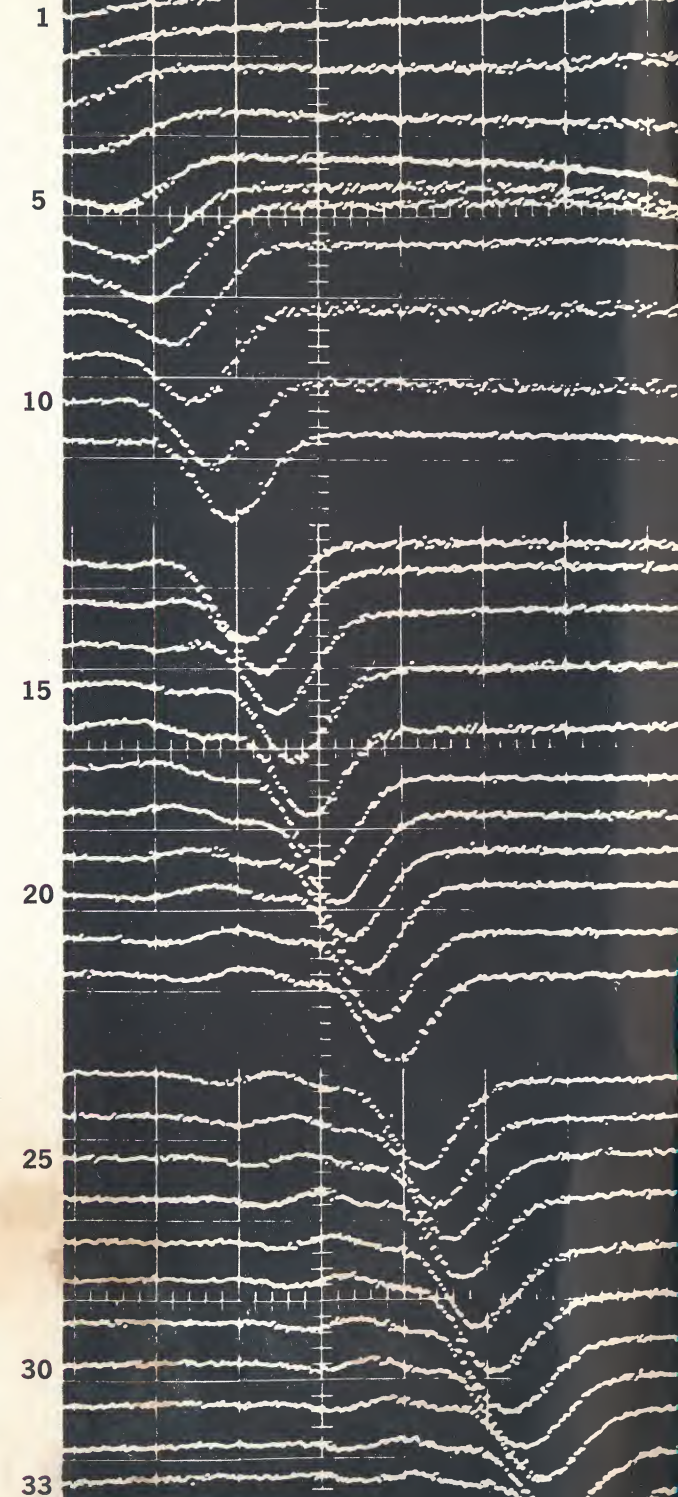
In 1962, Mr. Gunn observed that a constant voltage above a critical value applied to a small block of gallium arsenide produced a rapidly fluctuating current in the crystal. These fluctuations are periodic, and when coupled to an external circuit, they yield microwave power at frequencies of 500 to 7,000 megacycles a second. Unlike other microwave generators, no additional resonant circuitry is required to operate the device.

Early applications of the Gunn Effect were limited because of temperature build-up in the gallium arsenide specimen. As a result, microwave oscillations were only possible under a pulsed electric field. In 1964, however, Mr. Gunn and his associates reported the continuous operation of a generator at room temperature, a necessary requirement for most practical applications.* Temperature difficulties were overcome by reducing heat generation within the device, and by improving heat transfer away from the unit during operation.

A typical experimental specimen of gallium arsenide is about 30 microns thick with a surface of from 175 to 250 microns square. The specimen is alloyed between two metal contacts, and the alloyed assembly is ground to size as a single unit. This unit is then encapsulated and coupled to a simple external circuit to complete the tiny generator.

Though the Gunn Effect has no known application to computer technology, it may find uses in satellites, in communications, and in radar where its size, simplicity and small weight make it preferable to existing devices.

*N. Braslau, J. B. Gunn, and J. L. Staples, *IBM Journal of Research and Development*, 8, 545 (1964).



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